



Rubidij / stroncij datiranje

Rubidij

Rb – alkalni element

I.A grupa; Li, Na, K, Rb, Cs, Fr

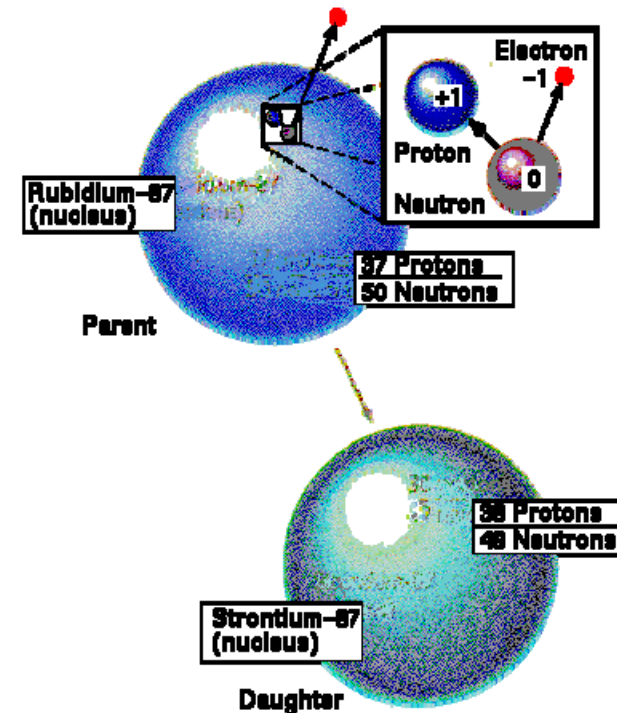
Ionski radijus; $\text{Rb}^+ = 1.48\text{\AA}$, $\text{K}^+ = 1.33\text{\AA}$

Izomorfna zamjena za K u muskovitu, biotitu, flogopitu, lepidolitu, ortoklasu, mikroklinu, silvinu i dr.

$^{87}\text{Rb} = 27.83\%$

$^{85}\text{Rb} = 72.17\%$

Beta raspad:



Stroncij

Sr – zemno-alkalni element

II.A grupa; Be, Mg, Ca, Sr, Ba, Ra

Ionski radijus; Sr = 1.13Å, Ca²⁺ = 0.99 Å

Izomorfna zamjena Ca u mnogim mineralima: plagioklasi, apatit, kalcit, aragonit, itd.

⁸⁸Sr = 82.53%

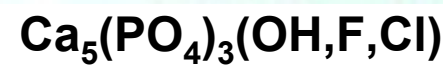
⁸⁷Sr = 7.04%

⁸⁶Sr = 9.87%

⁸⁴Sr = 0.56%

Svi stabilni

Apatit



Prosječni sadržaj Rb, K, Sr i Ca u magmatskim i sedimentnim stijenama

Table 6.1 Average Concentrations of Rubidium, Potassium, Strontium, and Calcium in Igneous and Sedimentary Rocks (Turekian and Wedepohl, 1961)

ROCK TYPE	Rb ppm	K ppm	Sr ppm	Ca ppm
1. Ultrabasic	0.2	40	1	25,000
2. Basaltic	30	8,300	465	76,000
3. High Ca granitic	110	25,200	440	25,300
4. Low Ca granitic	170	42,000	100	5,100
5. Syenite	110	48,000	200	18,000
6. Shale	140	26,600	300	22,100
7. Sandstone	60	10,700	20	39,100
8. Carbonate	3	2,700	610	302,300
9. Deep sea carbonate	10	2,900	2000	312,400
10. Deep sea clay	110	25,000	180	29,000

Modelna starost

$$^{87}\text{Sr} = ^{87}\text{Sr} + ^{87}\text{Rb} (e^{\lambda_{\text{Rb}} t} - 1)$$

$$\lambda_{\text{Rb}} = 1.39 \times 10^{-11} \text{god}^{-1}$$



$$\left(\frac{^{87}\text{Sr}}{^{86}\text{Sr}} \right)_{\text{uk}} = \left(\frac{^{87}\text{Sr}}{^{86}\text{Sr}} \right)_{\text{poč}} + \frac{^{87}\text{Rb}}{^{86}\text{Sr}} (e^{\lambda_{\text{Rb}} t} - 1)$$



Postupak;

1 $(^{87}\text{Sr}/^{86}\text{Sr})_{\text{uk}}$ određen u mineralu bogatom na K;

2 $(^{87}\text{Sr}/^{86}\text{Sr})_{\text{poč}}$ određen u mineralu bez K (na pr. apatit)

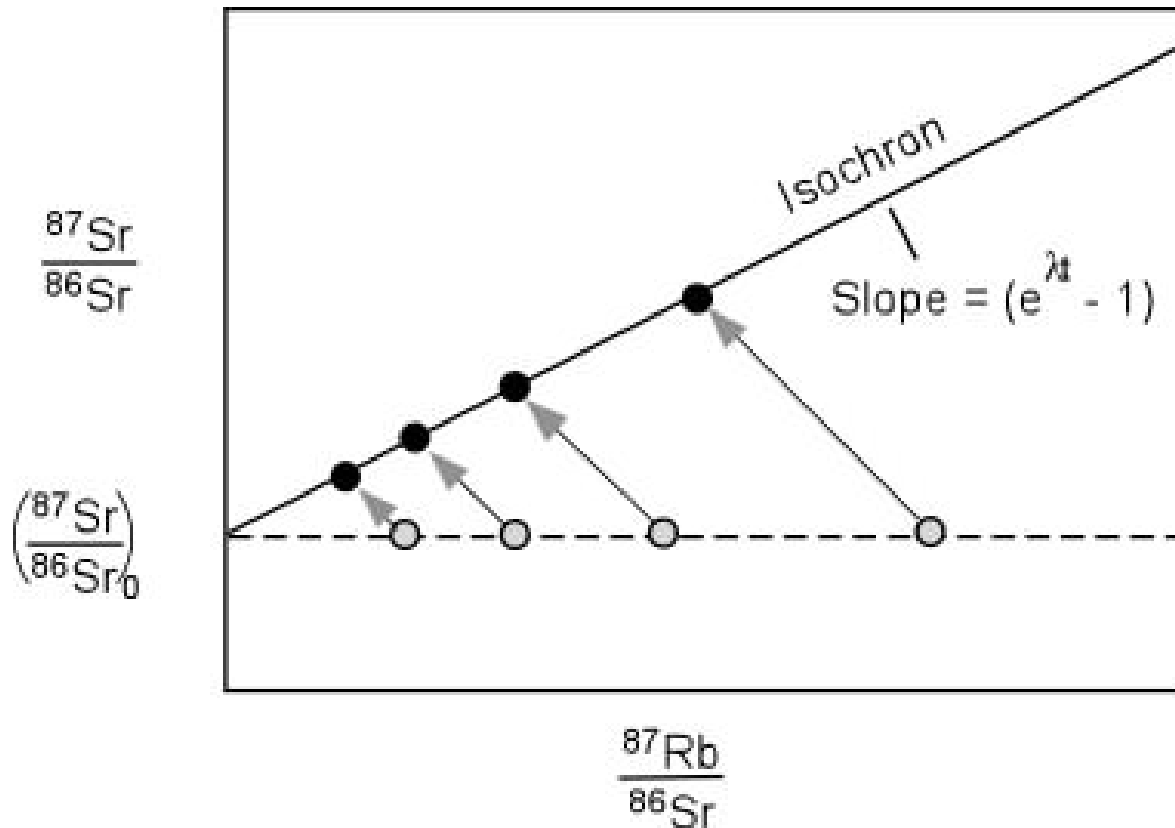
$$t = 2,303/\lambda \times \log \left\{ \left[\left(\frac{^{87}\text{Sr}}{^{86}\text{Sr}} \right)_{\text{uk}} - \left(\frac{^{87}\text{Sr}}{^{86}\text{Sr}} \right)_{\text{poč}} \right] / \left(\frac{^{87}\text{Rb}}{^{86}\text{Sr}} + 1 \right) \right\}$$

Datiranje magmatskih stijena

Metoda "isokrone"

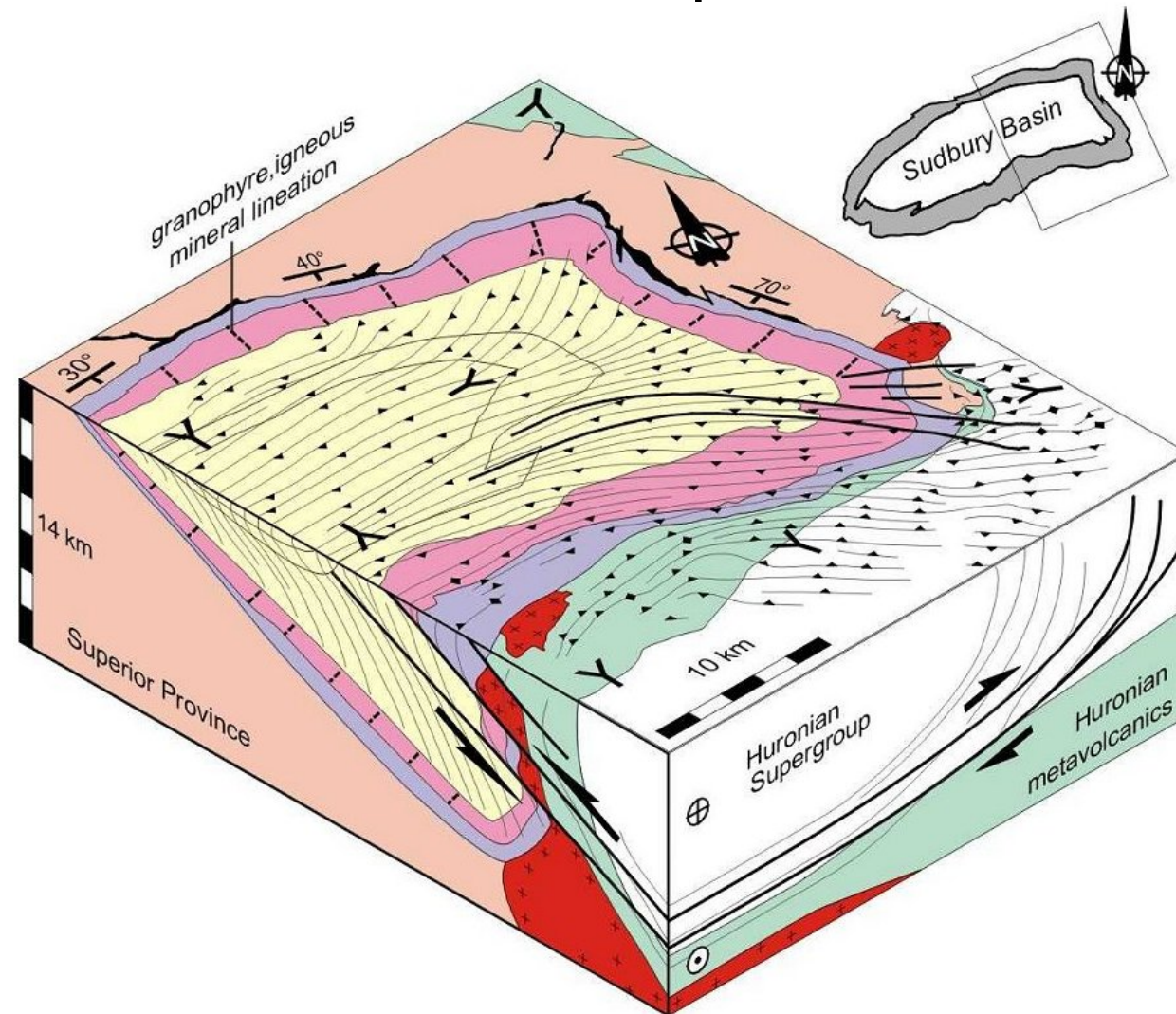
Jednadžba $(^{87}\text{Sr}/^{86}\text{Sr})_{\text{uk}} = (^{87}\text{Sr}/^{86}\text{Sr})_{\text{poč}} + ^{87}\text{Rb}/^{86}\text{Sr} (e^{\lambda_{\text{Rb}} t} - 1)$

predstavljena u obliku $y = a + bx$



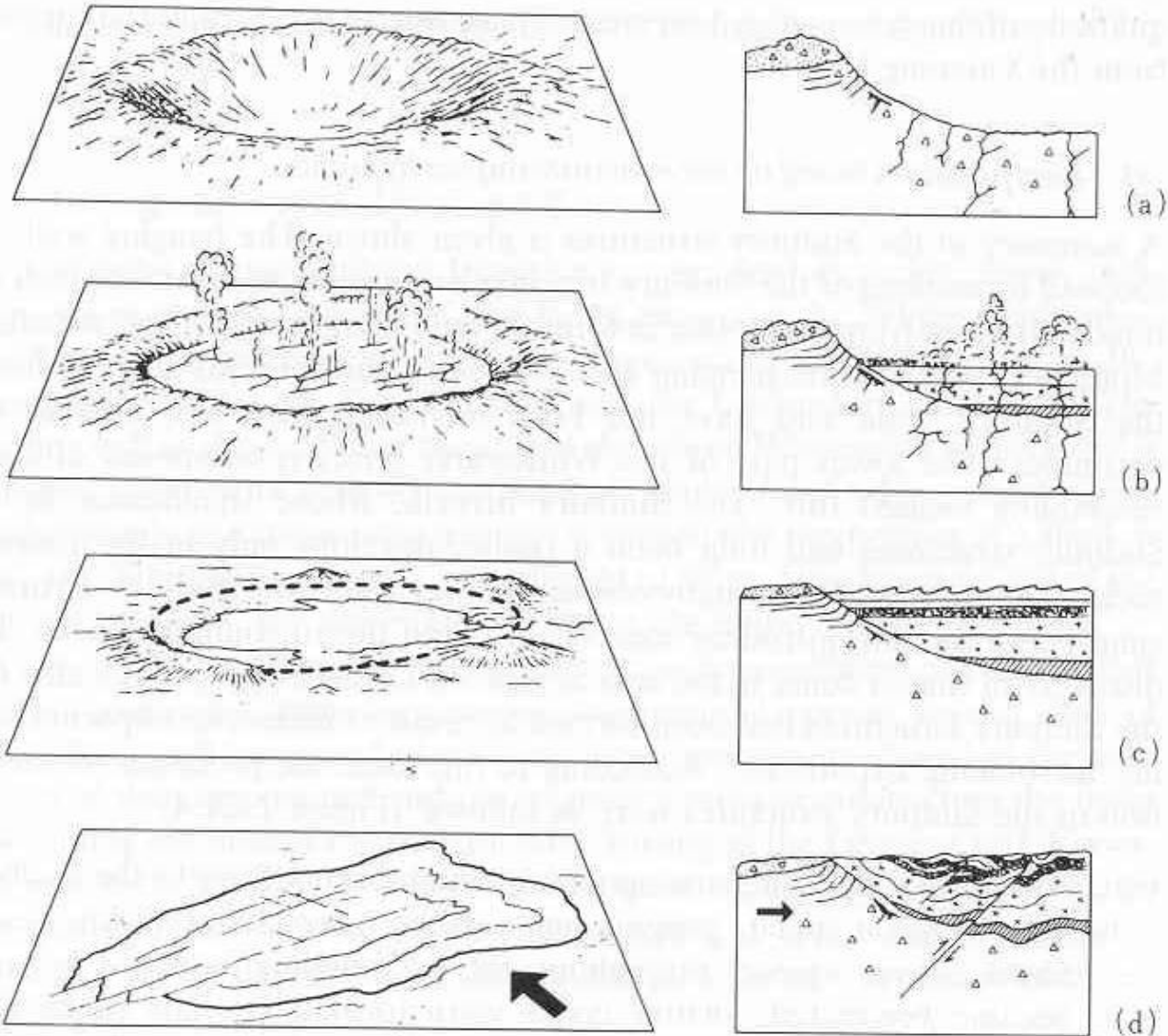
$$y = (^{87}\text{Sr}/^{86}\text{Sr})_{\text{uk}}$$
$$b = \text{tg}\alpha = (e^{\lambda_{\text{Rb}} t} - 1)$$
$$a = (^{87}\text{Sr}/^{86}\text{Sr})_{\text{poč}}$$
$$x = ^{87}\text{Rb}/^{86}\text{Sr}$$

Formiranje intruzije Sudbury (astroblema) izazvane meteoritskim impaktom



Block diagram of the eastern portion of the Sudbury Impact Structure showing the geometry of the Sudbury Igneous Complex (from Cowan et al., 1999). Lines with barbs are trajectories of ductile shape fabrics formed by post-impact orogenic deformation.

Formiranje intruzije Sudbury (astroblema) izazvane meteoritskim impaktom



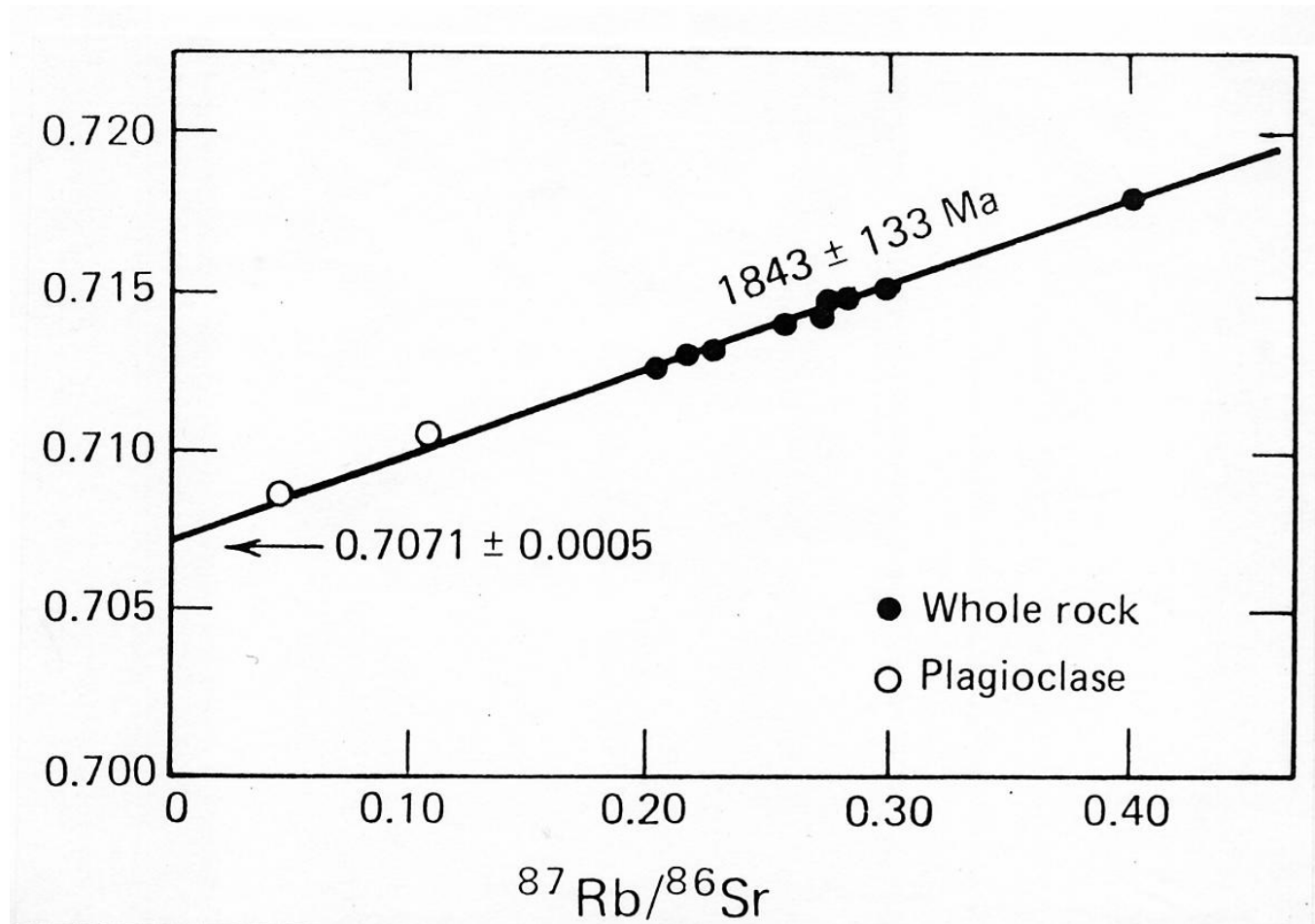
Formiranje intruzije Sudbury (astroblema) izazvane meteoritskim impaktom



Formiranje intruzije Sudbury (astroblema) izazvane meteoritskim impaktom

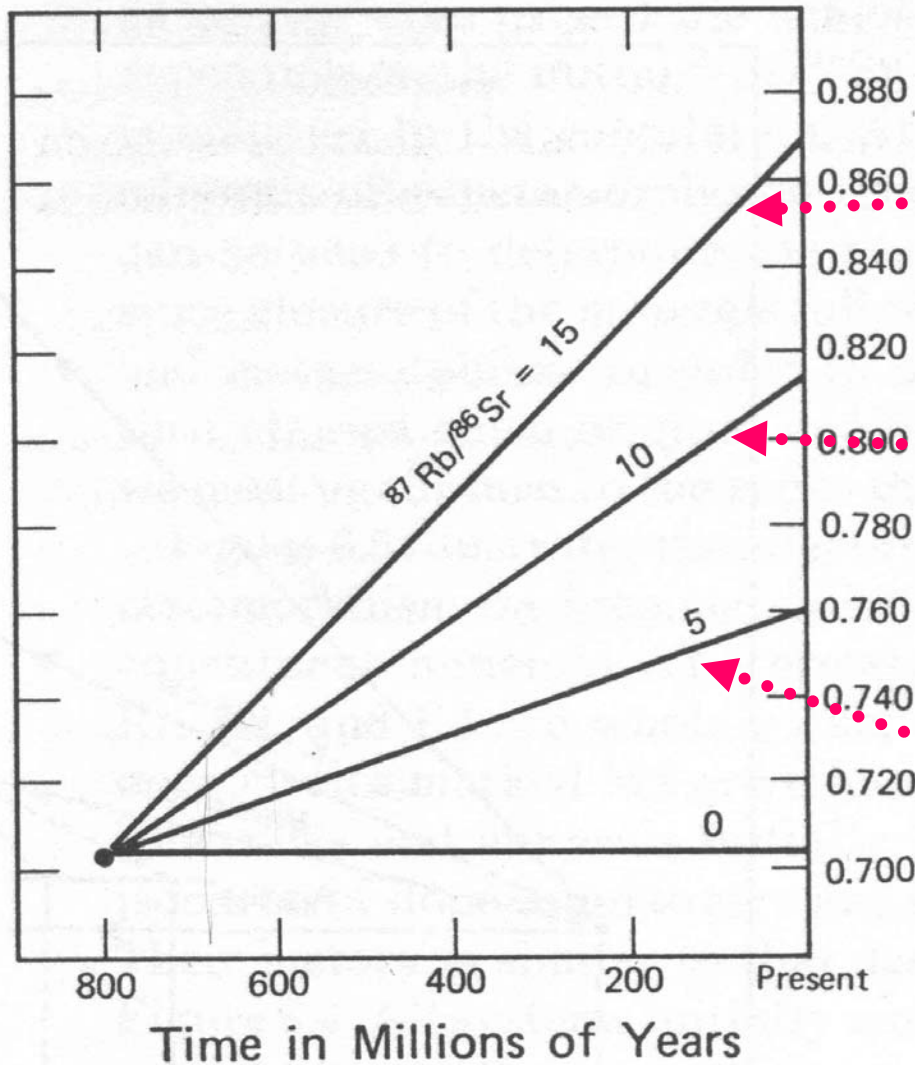


Formiranje intruzije Sudbury (astroblema) izazvane meteoritskim impaktom



Cijelo-stijenska isokrona (whole-rock) za svitu granofira, prijelaznih stijena i norita u Sudbury, Kanada.

Razvoj izotopa Sr u četiri stijene s različitim odnosom $^{87}\text{Rb}/^{86}\text{Sr}$,
tijekom 800 ma i početnim $(^{87}\text{Sr}/^{86}\text{Sr})_{\text{poč}} = 0.704$



granit



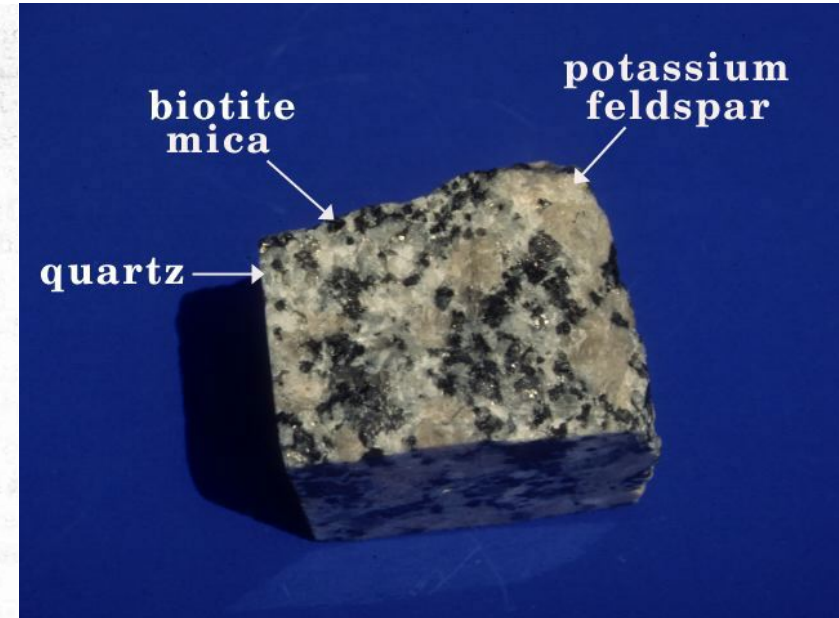
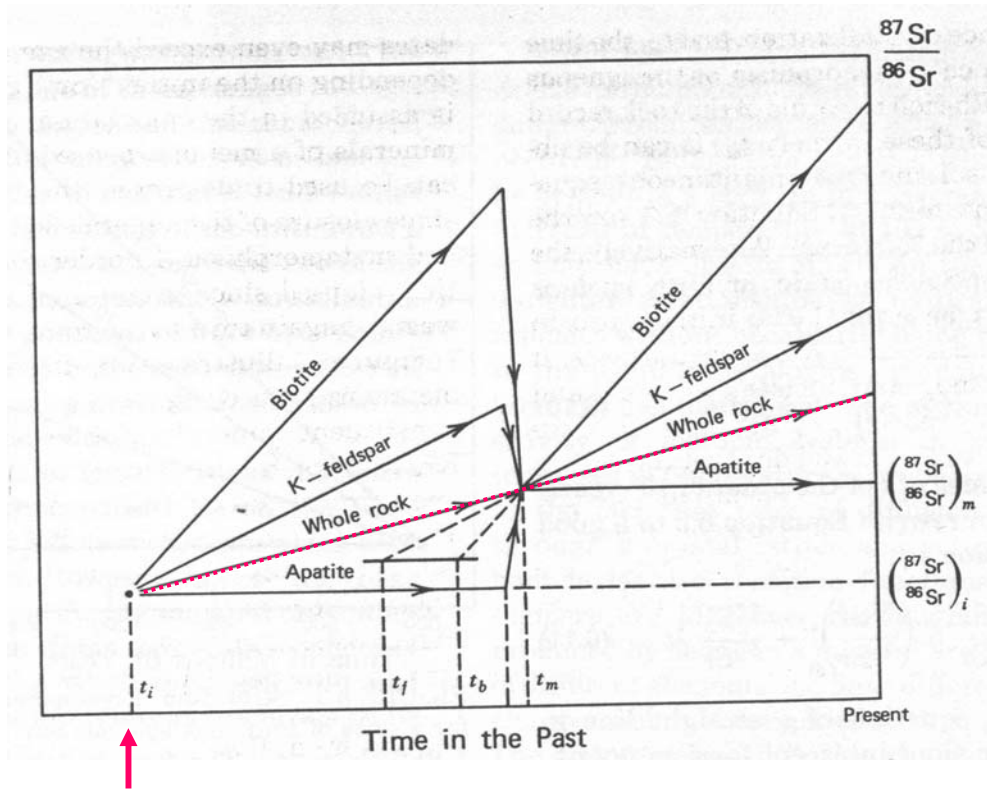
andezit



bazalt

Datiranje metamorfizma

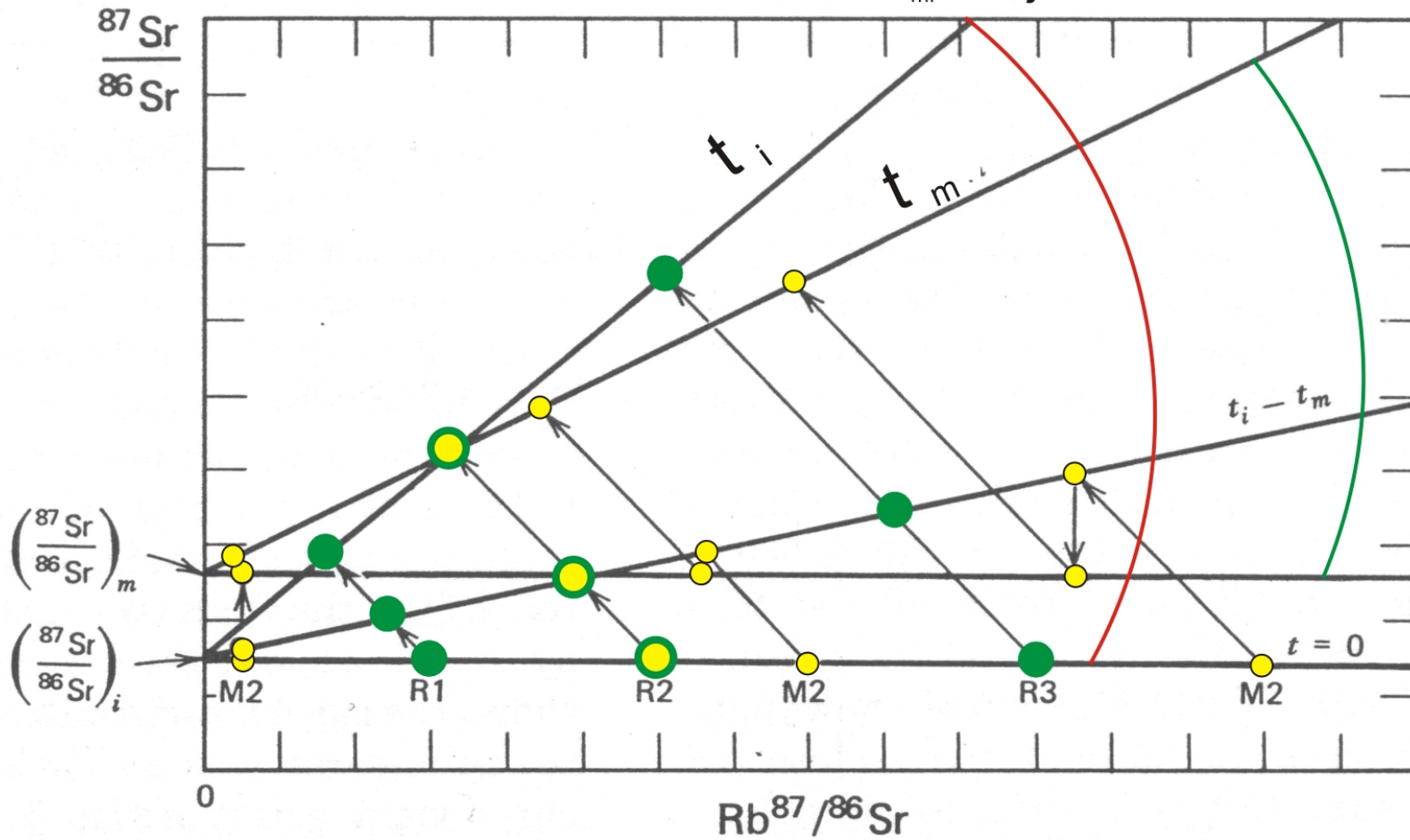
Zatvoreni sustav



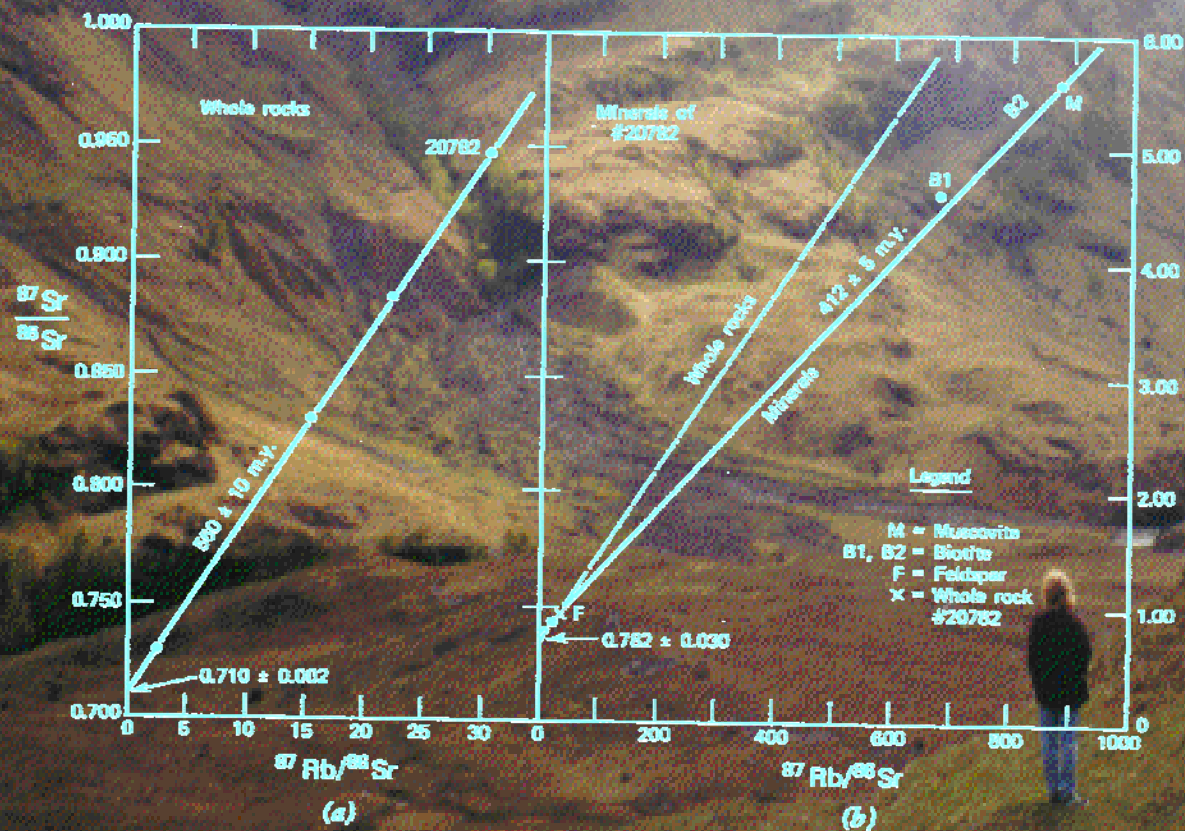
Razvoj izotopa Sr u cijeloj stijeni i njenim pojedinim mineralima. Tijekom metamorfizma nastupila je homogenizacija Sr-izotopa u svim mineralima.

Datiranje metamorfizma

t_i = vrijeme kristalizacije
 t_{mi} = vrijeme metamorfoze

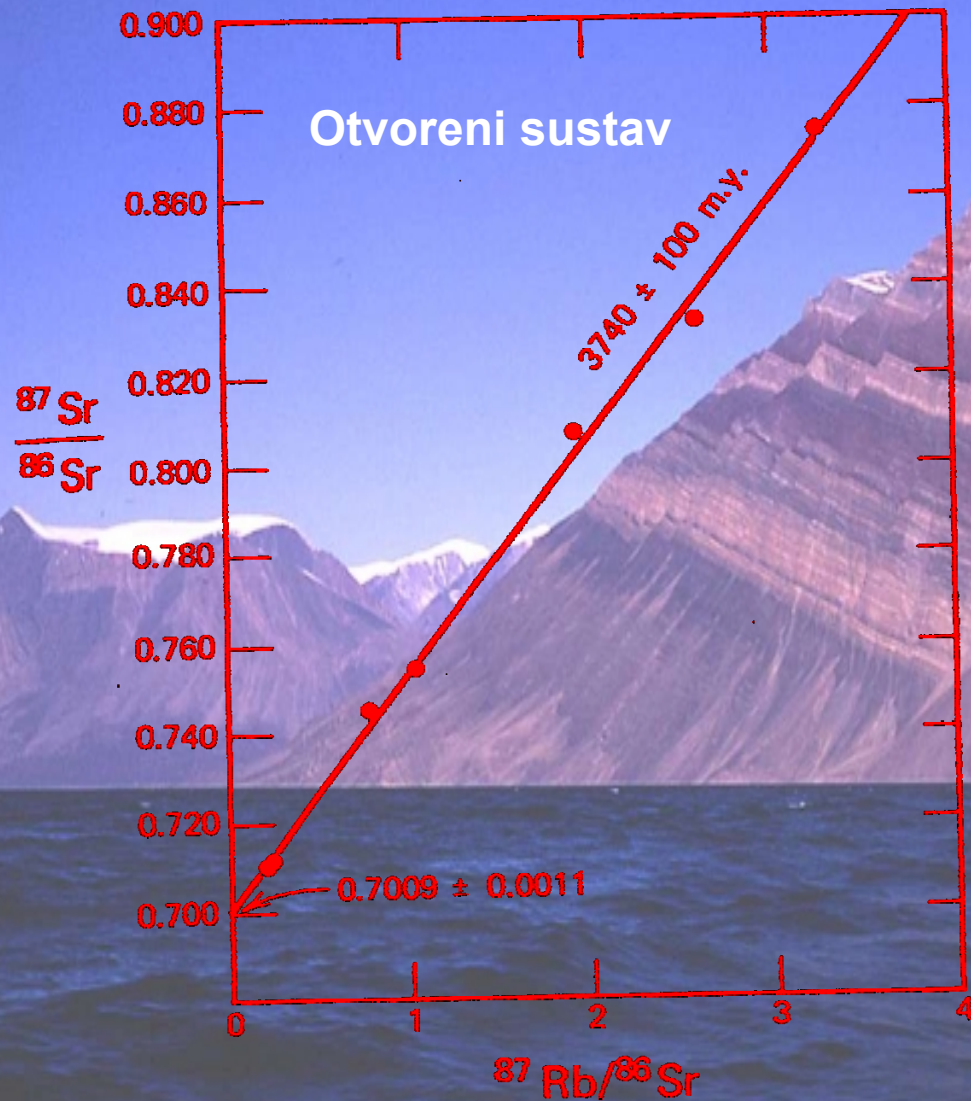


Datiranje metamorfizma



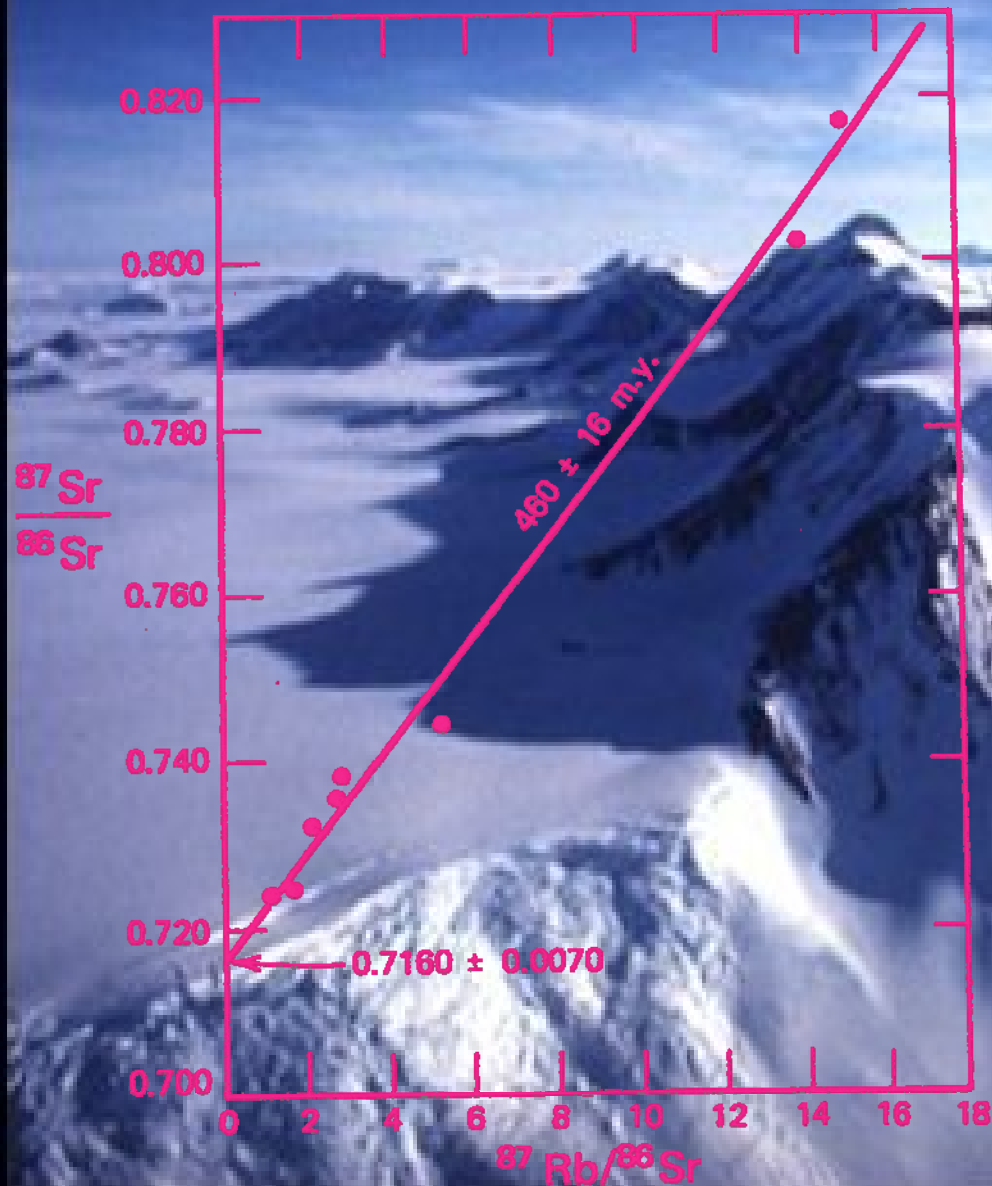
a) Cijelo-stijenska isokrona granitskih stijena Carn Chuinneag kompleksa u sjevernom Škotskom visočju, b) mineralna isokrona formirana Kaledonskim regionalnim metamorfizmom.

Datiranje metamorfizma najstarije stijene na Svijetu



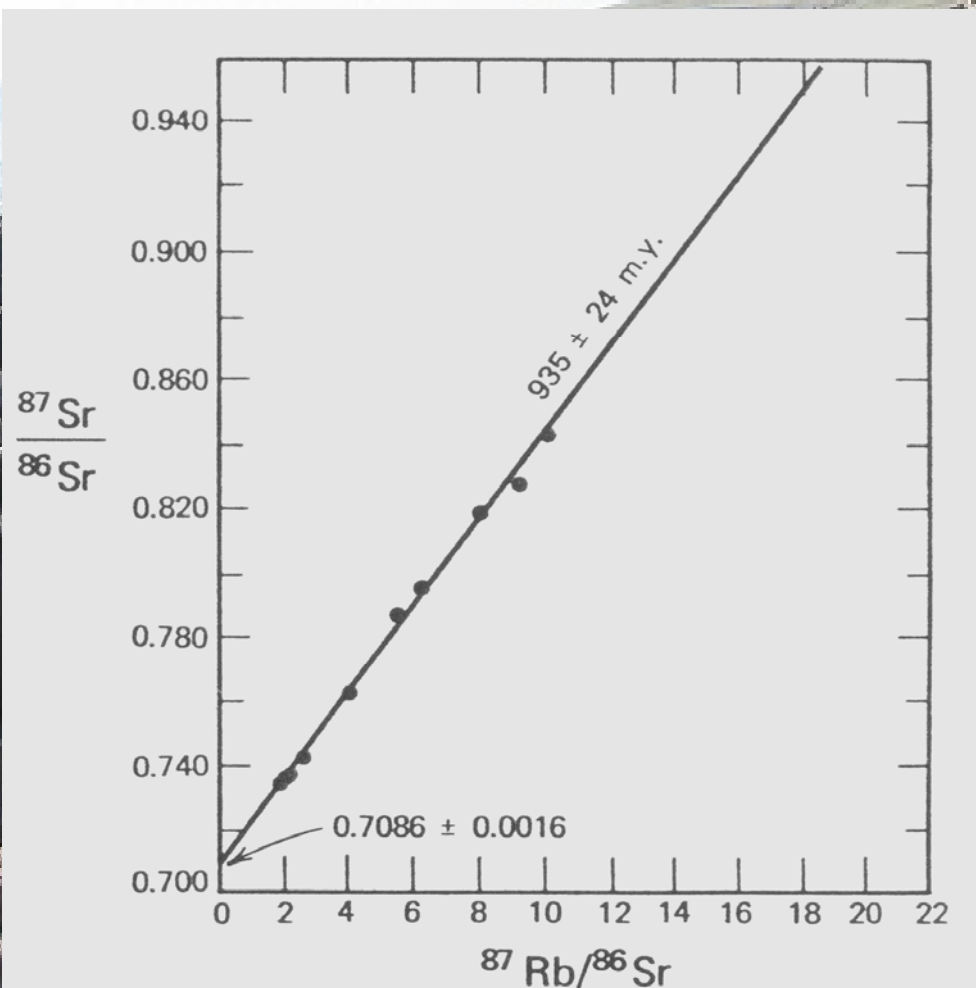
Cijelo-stijenska isokrona Amitsoq gnajseva iz Quilangarsuit područja u južnom **Greenlandu** (otvoreni sustav, homogenizacija izotopa između stijena). Ubrajaju se među najstarije poznate kopnene stijene. Graniti iz kojih su nastali morali su biti još stariji (Moorbath et al. 1972).

Datiranje metamorfizma



Cijelo-stijenska isokrona slejtova i filita iz La Gorce formacije, iz Wisconsin planina u Transantarktičnom gorskom lancu. Homogenizacija izotopa u niskometamorfnom kompleksu.

Datiranje nemetamorfoziranih sedimenata



Cijelo-stijenska isokrona nemetamorfoziranih siltita iz donjeg torridoniana (prekambrij), Stoer, SZ Škotska. Homogenizacija nastupila tijekom dijageneze i kompakcije sedimenata.

